Dr. Robert W. Conn, Chair
Fusion Energy Advisory Committee
School of Engineering
University of California, San Diego
9500 Gilman Drive
La Jolla, CA 92093-0403

Dear Dr. Conn:

This letter forwards two charges intended to follow up on specific recommendations made by your Committee in its Advisory Report on "A Restructured Fusion Energy Sciences Program." The report calls for expeditiously conducting two specific programmatic reviews to help the Department set the technical priorities of the restructured program:

- A Major U.S. Facilities Review
- An Alternative Concepts Review

The first review should be dealt with directly. As indicated by the enclosed charge, the second review is a little more involved and may require a longer time scale to fully address. I would like the committee to consider the fundamental investment strategy that we should use in funding alternative concepts. In the near term, however, we would like you to provide us with an assessment of one element within the catagory of alternative concepts, that of spherical tokamaks. Although the Fusion Energy Advisory Committee (FEAC) has suggested that the Alternative Concepts Review should also encompass inertial fusion energy, DOE is preparing a separate charge on that topic.

Please carry out the Facilities Review and the Alternative Concepts Review in parallel, using additional expertise outside of the FEAC's membership as necessary, so that the restructuring process may proceed. I would like to have your recommendations regarding facilities and, at least, the spherical tokamak aspects of the alternative concept review by mid-April.

The Department is most appreciative of the continued dedication shown by all FEAC members and your willingness to provide advice on important issues as we enter a period of unprecedented changes in the U.S. fusion science program. I will look forward to hearing the Committee's recommendations on these matters.

Sincerely,

Martha A. Krebs
Director
Office of Energy Research

Enclosures

Charge to the Fusion Energy Advisory Committee
for a Major Fusion Facilities Review

In its report to DOE of January 27, 1996, the Fusion Energy Advisory Committee (FEAC) recommended that a major U.S. fusion facilities review be immediately carried out as part of making the transition to a Fusion Energy Sciences Program. The purpose of this review is to examine the progress, priorities, and potential near-term contributions of TFTR, DIII-D, and Alcator C-MOD (and other facilities as appropriate), and produce an optimum plan for obtaining the most scientific benefit from them. This optimzation should be within the context of the overall recommendations of the report on "A Restructured Fusion Energy Sciences Program" and should work within the funding level for these three facilities in the President's FY 1997 Budget Request.

The Department therefore requests the FEAC to organize and conduct such a review as expeditiously as possible, using whatever approach it deems most appropriate. In carrying out the review, the FEAC is encouraged to involve foreign participants in the review process.

There are specific points that the review should address:

- What are the highest priority near-term (~2 years) scientific objectives to be accomplished with these facilities to advance the goals of the U.S. Fusion Energy Sciences Program?

- What actions could be taken to more effectively use these facilities to address the objectives identified above? For example, changes in theory and modeling collaborations, in international collaborations, in enabling technology capabilities, in operating schedules, and in the allocation of resources among the facilities should be considered.

- In the case of TFTR, if the resources are available to permit operation of TFTR through FY 1997, what are the specific scientific objectives that would merit continuing operations through FY 1997 and into FY 1998? How would you measure progress toward such objectives in a review in mid FY 1997?

The FEAC's findings and recommendations in response to this charge should be delivered to the Director of Energy Research by mid-April.

Charge to the Fusion Energy Advisory Committee
for an Alternative Concepts Review

In its report to DOE of January 27, 1996, the Fusion Energy Advisory Committee (FEAC) recommended that a review of Alternative Concepts be carried out as part of making the transition to a Fusion Energy Sciences Program. This review should fundamentally be directed at recommending an investment strategy for funding alternative concepts. What criteria, in addition to scientific excellence, should determine the effort devoted to the Alternative Concept Program (for example, similarity to or difference from the tokamak, power density, size, etc.)? Within the general guidelines of this recommendation, the Department requests the FEAC to organize and conduct such a review as expeditiously as possible, using whatever approach it deems most appropriate. Although FEAC recommended that inertial fusion energy (IFE) should be considered as part of the alternative concepts review, the Department recognizes the distinct characteristic of IFE and will request a review of IFE in a separate charge.

It is generally recognized that the various alternative concepts are at significantly different levels of development. Within this context, the review should address the following:

1. Review the present status of alternative concept development in light of the international fusion program. As part of this review, consider not only the prospects for alternative concepts as fusion power systems but also the scientific contributions of alternative concept research to the Fusion Energy Sciences Program and plasma science in general.

2. The review should produce an overall strategy for a U.S. alternative concepts development program including experiments, theory, modeling/computation and systems studies, which is well integrated into the international alternative concepts program. The U.S. plan and supporting documentation should include but not be limited to:

    - o recommendations on how best to collaborate in alternative concepts where our international partners already have large experiments (e.g., the stellarator),

    - o recommendations for encouraging new innovations in alternative concepts,

    - o a methodology for assessing on a comparative basis the scientific progress of alternative concepts in their early stages of development, and

    - o a set of criteria for use in determining when an alternative concept is ready to undertake a "proof-of-principle" scale experiment. For this purpose, consider the Princeton Large Torus as the proof-of-principle experiment that validated the tokamak concept.

3. The spherical tokamak is recognized to be a scientifically advanced alternate. Based on the FEAC recommendations to enhance research on alternative concepts, the FY 1997 budget request contains proposed funding for the National Spherical Tokamak Experiment (NSTX) at Princeton. An experiment of this size and scope could be considered a "proof-of-principle" for this concept. There are several ongoing spherical tokamak programs and several new grant applications also under review. We are not asking you to review any specific proposals. Rather an assessment of the readiness of this concept to move to "proof-of-principle" experimentation would provide a useful example to be carried out early in the overall review process. This assessment should specifically address, in the international context, the present theoretical understanding and experimental data base of the spherical tokamak concept. In addition, the potential for such spherical tokamak research to resolve key physics and technology issues of importance to both the conventional tokamak and the spherical tokamak as a reactor in its own right should be considered.

The FEAC's findings and recommendations with regard to the spherical tokamak assessment should be delivered to the Director of Energy Research by mid-April. The overall review of alternative concepts should be delivered by mid-July.